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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/604,651	08/07/2003	Chia-Tien Peng	10958-US-PA	1650

31561 7590 02/26/2007  
JIANQ CHYUN INTELLECTUAL PROPERTY OFFICE  
7 FLOOR-1, NO. 100  
ROOSEVELT ROAD, SECTION 2  
TAIPEI, 100  
TAIWAN

EXAMINER
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GHYKA, ALEXANDER G

ART UNIT	PAPER NUMBER
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2812

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	02/26/2007	PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

<b>Office Action Summary</b>	<b>Application No.</b> 10/604,651	<b>Applicant(s)</b> PENG ET AL.	
	<b>Examiner</b> Alexander G. Ghyska	<b>Art Unit</b> 2812	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 12/06/2006, RCE.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1,2,4,7-11,13 and 16-28 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1,2,4,7-11,13 and 16-28 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

ALEXANDER GHYKA  
PRIMARY EXAMINER

*AU 2812*  
*Alex Ghyska*

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 07 August 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)                                | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                       | 5) <input type="checkbox"/> Notice of Informal Patent Application                       |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

### **DETAILED ACTION**

Applicants' RCE of 12/06/2006 has been considered and entered in the record. Claims 1-2, 4, 7-11, 13 and 16-28 are now under consideration. The following new rejections are made in view of Applicants' amendments and arguments.

#### ***Claim Objections***

Claims 1-2, 4, 7-11, 13 and 16-28 are objected to because of the following informalities: the last line of Claim 1 states "voltage determining from the plasma treatment". Appropriate correction is required. The Examiner respectfully suggests language such as "voltage determined by said plasma treatment".

#### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to

consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

**Claims 1 and 20-28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Takayama et al (US 6,610,142) in view of Koda et al (US 5,563,093).**

The present claims generally require forming an amorphous silicon layer over a substrate, performing a plasma treatment to the amorphous silicon layer, wherein the plasma treatment is selected from nitrous oxide, ammonia or hydrogen plasma, transforming the amorphous silicon layer into a polysilicon layer by laser annealing, patterning the polysilicon layer to form a plurality of island polysilicon layers, forming a channel region and a doped source/drain region on each side of the channel region and forming a gate over each channel region, wherein the channel region composed of polysilicon has an adjusted threshold voltage determining from the plasma treatment.

Takayama et al disclose forming a silicon oxide film, a plasma treatment, the formation of an amorphous silicon film, and its subsequent crystallization by laser annealing. See Example 1, column 6, lines 40-65. Takayama et al disclose nitrogen and oxygen containing plasmas (column 5, lines 25-35). Moreover, Takayama et al discloses the formation of a channel region, source/drain region and gate in the formation of a TFT transistor as required by the present claims. See Example 4, lines 1-60. Even though, Takayama et al disclose an additional silicon oxide film, the aforementioned claim limitations are obvious as the present Claim language does not exclude the additional silicon oxide layer. Takayama discloses that " nucleation sites are

controlled by selectively exposing the amorphous silicon film to a plasma". See the Abstract, second to last sentence.

Takayama et al differs from the Claims at hand in that Takayama et al does not disclose performing a plasma treatment to the amorphous silicon layer, wherein the plasma treatment is selected from nitrous oxide, ammonia or hydrogen plasma, or the resultant adjustment in threshold voltage.

Koda et al disclose a process for forming a polysilicon layer comprising: forming an amorphous silicon layer 3 (Figure 1, col. 12, lines 63-67); pre-treating the amorphous silicon layer such that a surface of the amorphous layer is nitridized to form a silicon nitride layer 53, wherein the pre-treating step is conducted by treating the amorphous silicon layer with nitrogen containing plasma. See Figure 2, col. 13, lines 1-5); and then crystallizing the pre-treated amorphous silicon layer to form a polysilicon layer 43. Moreover Koda shows the use of N<sub>2</sub>O and NH<sub>3</sub> plasma to nitride the surface. See column 13, lines 1-5, Figure 2 and column 21, Table 3, Sample 14.

It would have been obvious for one of ordinary skill in the art, at the time of the invention, to use the pre-treating process of Koda et al in the process of Takayama et al, for its known benefit of forming polysilicon having large grain sizes as disclosed by Koda. As both references pertain to crystallizing an amorphous silicon layer to form polysilicon, a *prima facie* case of obviousness is established. Moreover, it would be obvious to one of ordinary skill in the art that the resultant large grain sizes of the polysilicon would adjust its threshold voltage.

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

**Claims 2, 4, 7-11, 13 and 16-19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Takayama et al (US 6,610,142) and Koda et al (US 5,563,093) as applied to claims 1 and 20-28 above, and further in view of Jen et al (JJAP Part 2: Letters 1991, 33 (7B), L997-L979) and Luan et al (Jour. Of Appl. Phys. 1990, 68(7), 3445-3450).**

Takayama et al and Koda et al are relied upon as discussed above.

However, Takayama et al and Koda et al do not disclose an ammonia plasma which results in a positive shift of the threshold voltage of the TFT or a nitrous oxide plasma which results in a negative shift threshold voltage.

Jen discloses the formation of a thin film transistor, wherein a nitrous oxide plasma results in a smaller or negative shift of the threshold voltage of 0.5V. See the Abstract.

Luan et al disclose the formation of thin film transistors and the effect of NH<sub>3</sub> plasma in increasing or positive shift in threshold voltage. See the Abstract and p. 3447, section B.

It would have been obvious to one of ordinary skill in the art, at the time of the invention, that the nitrogen and/or oxygen containing plasma of Takayama et al and

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Koda et al can be used to adjust the threshold voltage in negative or positive shifts in light of the disclosure of Jen that ammonia plasma results in a positive shift of threshold voltage and the disclosure of Luan et al that nitrous oxide results in a negative shift. A *prima facie* case of obviousness is established, as all of the references pertain to thin film transistors and the use of plasma for the benefit of adjusting the threshold voltage as disclosed in the prior art would be readily apparent to one of ordinary skill in the art.

### **Conclusion**

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Alexander G. Ghyka whose telephone number is (571) 272-1669. The examiner can normally be reached on Monday through Friday during general business hours.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael Lebentritt can be reached on (571) 272-1873. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.



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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

AGG

February 15, 2007

ALEXANDER GHYKA  
PRIMARY EXAMINER

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